

Precalc Warm Up # 7-2

In a class of 36 students, kids are seated in rows such that every row contains an equal number of people. If the number of rows is increased by 3, then there would need to be 2 less kids in each row. How many rows are there?

Let r = # rows originally and n = # people in each row.

$$\begin{aligned}
 r n &= 36 \\
 (r + 3)(n - 2) &= 36 \\
 r \cdot n - 2r + 3n - 6 &= 36 \\
 36 - 2r + 3n - 6 &= 36 \\
 -2r + 3n &= 6 \quad \text{and from line 1, } n = \frac{36}{r} \text{ so} \\
 -2r + 3\left(\frac{36}{r}\right) &= 6 \\
 -2r^2 + 108 &= 6r \\
 0 &= 2r^2 + 6r - 108 \\
 0 &= r^2 + 3r - 54 \\
 0 &= (r + 9)(r - 6)
 \end{aligned}$$

Since we can't have - 9 rows, there must have been 6

EXERCISES 3.1.1

HW Questions: p. 63

1. What positive number, when subtracted from its own square gives an answer of 56?

2. Eight times the sum of a number and its reciprocal results in 34. Find this number.

let n = the number.

$$\begin{aligned}
 8\left(n + \frac{1}{n}\right) &= 34 \\
 n\left(n + \frac{1}{n}\right) &= \frac{34}{8}n \\
 n^2 + 1 &= \frac{17}{4}n \\
 n^2 - \frac{17}{4}n + 1 &= 0
 \end{aligned}$$

$$\begin{aligned}
 4n^2 - 17n + 4 &= 0 \\
 (4n - 1)(n - 4) &= 0 \\
 n &= \frac{1}{4}, 4
 \end{aligned}$$

4. The product of two numbers is 88. What are the numbers if one number is 3 more than the other?

6. Twice the square of Graham's height is 6 metres more than his height. How tall is he?

t

r

7. Rachelle has taken $(4x - 6)$ hours to travel 102 km at a speed of $(25x + 1)$ kmh^{-1} . How fast was she travelling?

$$(25(2) + 1) = 51$$

$$rt = d$$

$$(25x + 1)(4x - 6) = 102$$

$$h^{-1} = \frac{1}{h}$$

$$100x^2 = 150x + 4x - 6 - 102 = 0 \quad \frac{\text{km}}{h}$$

$$100x^2 - 146x - 108 = 0$$

$$50x^2 - 73x - 54 = 0$$

$$(50x + 27)(x - 2) = 0$$

$$x = 2$$

$$\begin{array}{r} -100x \\ + 27x \\ \hline -73x \end{array}$$

10. At a local screening of a movie, 450 people are seated in rows such that every row contains an equal number of people. However, if there were three more people in each row the number of rows needed would be reduced by 5. How many rows are there?

Let $r = \# \text{ rows}$

$x = \# \text{ people in each row}$

$$r \times x = 450 \quad x = \frac{450}{r}$$

$$(r - 5)(x + 3) = 450$$

$$rx + 3r - 5x - 15 = 450$$

$$450 + 3r - 5x - 15 = 450$$

$$3r - 5x = 15$$

$$r \left[3r - 5\left(\frac{450}{r}\right) \right] = 15$$

11. Derek sold walking sticks. Had he charged \$10 extra for each stick he would have made \$1,800. However, had he sold 10 more sticks at the original price he would have made \$2,000.
- How many sticks did he sell?
 - How much was each stick?

let x = # of walking sticks
 y = original price of a stick

$$(y+10)x = 1800$$

$$(x+10)y = 2000 \rightarrow y = \frac{2000}{x+10}$$

solve system. $\left(\frac{2000}{x+10} + 10\right)x = 1800$

$$(x+10)\left(\frac{2000x}{x+10} + 10x\right) = (1800)(x+10)$$

$$2000x + 10x^2 + 100x = 1800x + 18,000$$

17. Two taps having different rates of flow are used to fill a large water tank. If tap A is used on its own it will take 5 hours longer to fill the tank than it would tap B to fill it on its own. Together, the taps would fill the tank in 6 hours. Assuming that the taps are running at full capacity, find
- how long will it take for tap A to fill the tank.

- how long will it take for tap B to fill the tank.

#17 from last night:

Two taps having different rates of flow are used to fill a large water tank. If tap A is used on its own it will take 5 hours longer to fill the tank than it would tap B to fill it on its own. Together, the taps would fill the tank in 6 hours.

a. How long does it take for tap A to fill it alone?

Let A = # hrs for tap A alone to fill it.

Tap A's rate = $\frac{1}{A}$ of the tank filled per hour.

$A - 5$ = # hrs for tap B to fill it alone.

Tap B's rate = $\frac{1}{A-5}$ of the tank filled per hour.

$$A(A-5)\left(\frac{1}{A} \cdot 6 + \frac{1}{A-5} \cdot 6\right) = 1(A)(A-5)$$

$$6(A-5) + 6A = A(A-5)$$

$$6A - 30 + 6A = A^2 - 5A$$

$$0 = A^2 - 17A + 30$$

$$0 = (A - 15)(A - 2)$$

Since 2 hours doesn't make sense (why?), it takes tap A 15 hours to fill it alone

b. How long for tap B to fill it?

It takes tap B 10 hours alone to fill it.

Holly bought a bunch of soccer balls for \$180. She decided to keep one for herself and sold the rest for \$1 more than what she bought them for. Even after keeping the one ball, she made a profit of \$10. How many balls did she purchase to begin with?

Let n = #balls she bought at the beginning and
let p = price of each

$$np = 180$$

$$(n-1)(p+1) = 190$$

$$np + n - p - 1 = 190$$

$$180 + n - p - 1 = 190$$

$$n - p - 1 = 10$$

$$n - p = 11$$

$$\text{and from first line, } n = \frac{180}{p}$$

$$\frac{180}{p} - p = 11$$

$$180 - p^2 = 11p$$

$$0 = p^2 + 11p - 180$$

$$0 = (p - 9)(p + 20)$$

$$p = 9 \text{ or } -20,$$

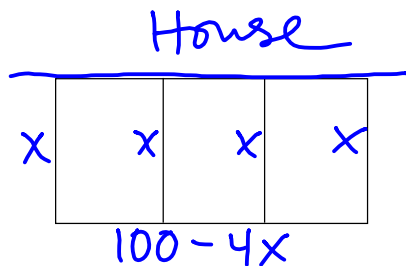
$$\text{so } p = 9$$

$$\text{since } np = 180, \text{ then } n = 20$$

She bought 20 soccer balls to begin with.

Modeling a geometric type of problem:

1. Farmer Fionna wants to enclose her garden, using one side of her house as a fence, to have 3 congruent sections for different crops. She has 100 meters of fencing material, and wants to maximize her area. What should she have as dimensions?

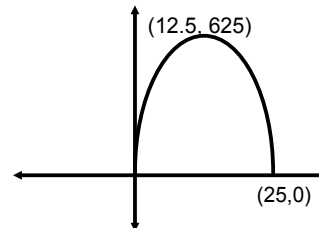


$$A = x(100 - 4x)$$

$$= 100x - 4x^2$$

parabola that opens down
and zeros at 0 and 25

dimensions: 12.5 m by 50 m



Group review:

Which composite(s) do not exist? Support your answer.

$$f(x) = x$$

$$g(x) = \sqrt{x - 4}$$

$$d: \mathbb{R}$$

$$r: \mathbb{R}$$

Exist?

Yes

$$d: x \geq 4$$

$$r: y \geq 0$$

$$f(g(x))$$

$$g(f(x))$$

$$g(g(x))$$

No

~~Yes~~ No $r_g \subseteq d_g$
 $[0, \infty) \not\subseteq [4, \infty)$

Find $f^{-1}(x)$ for the function:

$$f(x) = -\sqrt{x-3} + 8$$

d: $x \geq 3$
r: $y \leq 8$

State domain and range of both.

$$x = -\sqrt{y-3} + 8$$

$$x - 8 = -\sqrt{y-3}$$

$$(-x + 8)^2 = (\sqrt{y-3})^2$$

$$x^2 - 16x + 64 = y - 3$$

$$y = x^2 - 16x + 67 \quad ; \quad x \leq 8$$

range: $y \geq 3$

Describe the transformations that map $f(x)$ to $g(x)$.

$$f(x) = x^3$$

$$g(x) = -3(4 + 2x)^3 + 6$$

$$-3[2(x+2)]^3 + 6$$

d: vertical stretch 3 horiz compression of $\frac{1}{2}$

r: r_x reflect in x-axis

s: left 2, up 6

Write $g(x)$ in terms of $f(x)$:

$$g(x) = -3f(4 + 2x) + 6$$

Write the standard form equation of the circle.
Name the center and simplified radius.

$$\begin{aligned}
 &2x^2 + 2y^2 - 12x + 24y + 81 = 0 \\
 &2(x^2 - 6x + \underline{9}) + 2(y^2 + 12y + \underline{36}) = -81 \\
 &\quad \quad \quad +18 \quad +72 \\
 &2(x-3)^2 + 2(y+6)^2 = 9 \\
 &(x-3)^2 + (y+6)^2 = \frac{9}{2} \quad r = \frac{3}{\sqrt{2}} \\
 &\text{center } (3, -6) \quad r = \frac{3\sqrt{2}}{2}
 \end{aligned}$$

Review PC 2.8 Variation.

HW: SL Book

p. 64 #12 - 14, 16, 18

and Review WS #2

(key posted online)

Test: Thursday & Friday

Covers: PC 2 and SL 3, 5, & 6